1. Executive Summary

The City of Manhattan Beach (City) has embarked on an ambitious effort to improve its storm drain infrastructure. As a part of this effort, the City is conducting a detailed hydrologic and hydraulic analysis to determine the existing capacity of the storm drain system within the City limits; identify locations of potential flooding and recommend storm drain improvement projects as part of a 20-year Capital Improvement Program (CIP). This report provides specific recommendations on how to reduce stormwater flooding, as well as recommendation for multi-benefit projects that also have the added benefit of water quality treatment. The primary goals of the Storm Drain Master Plan project were the following:

1. Primary Goal: Develop a hydrology and hydraulic model to determine the capacity and identify deficiencies of the existing storm drain system for the 10-year, 25-year (i.e. Urban Flood), and Capital Flood (i.e. 50-year) storm events.

2. Secondary Goal: Develop a CIP hydrology and hydraulic model with the focus on meeting requirements of the Urban Flood level of protection. Per the 2006 Los Angeles County Hydrology Manual, the Urban Flood is defined as runoff from a 25-year frequency design storm on a saturated watershed. This flow should be split to allow conveyance in the street and in the storm drain when flows exceed street capacity. To meet the Urban Flood level of protection, the existing storm drain system was modified (e.g. pipe upsized) for the 10-year CIP model so the peak water surface elevation in the storm drain system was below the rim elevation. The proposed improvements were then adjusted to keep the peak water surface elevation less than or equal to right-a-way elevations (roughly 0.5-ft above the rim elevation) during the 25-year storm event.

3. Tertiary Goal: The storm drain CIP model was then updated for the Capital Flood (i.e.50-year) storm event with the intent to keep the peak water surface elevation of the runoff within the public right-of-way. Furthermore, the improvements were to maintain passable street conditions for fire, police, and emergency vehicles, and protect property from flood damage.

4. Identify locations for multi-benefit projects to facilitate compliance with the 2012 Los Angeles Municipal Separate Storm Sewer System (MS4) National Pollutant Discharge Elimination System (NPDES) Permit (Permit). AECOM evaluated opportunities for multi-benefit projects that retain non-stormwater runoff and runoff from the 85th percentile, 24-hour storm event while also achieving benefits associated with flood control and water supply.

XP-SWMM 2D (version 2018.2.2) was the hydrologic software used to conduct the capacity analysis of the existing storm drain system within the City limits. The model was created utilizing Los Angeles County data for topography, landuse, precipitation depths, and soil data. Existing storm drain system model inputs were based on record drawings provided by the City. The existing system flood results were compared to reported flooding during December 28, 2004 storm event to verify if predicted flooding results agreed with the reported flooding locations.

Figures 5-1 through 5-4 show the results of the Existing Conditions XP-SWMM model for the 10-year, 25-year, and 50-year storm events, respectively.

Following the evaluation of existing flooding conditions, the study area was reviewed to identify potential locations for flood management measures to move towards compliance with aforementioned stormwater management goals. As part of the study, the following management measures were evaluated:

1. Improvements to existing storm drain system;
2. New storm drain mainlines and laterals;
3. Location of multi-benefit projects, including bioswales, expansion of existing detention basins, drywells, and underground infiltration galleries.

Figures 5-5 through 5-7 show the results of the Proposed (i.e. CIP) Conditions XP-SWMM model for the 10-year, 25-year, and 50-year storm events, respectively. These results show reduction of flooding assuming improvements to the LACPW mainlines. Figures 5-5 through 5-7 show the results of the Proposed (i.e. CIP) Conditions XP-SWMM model for the 10-year, 25-year, and 50-year storm events, respectively. Figures 5-9 through 5-11 show the model results without LACPW improvements for the 10-year, 25-year, and 50-year storm events, respectively.

Based upon the analysis conducted in this study, selected improvement options to address the stormwater management needs within the City were summarized and ranked to develop the 20-year storm drain CIP. Typically, master-planned facilities are classified into different categories. A Priority 1 Project may relieve flooding in areas without storm drain facilities. A Priority 2 Project may mitigate development impacts and improve drainage conditions. Potential improvement projects were scored utilizing the following criteria:

- Feasibility of project construction;
- Cost for project and ability to fit project cost within the overall 20-year CIP budget;
- Community Benefits such as improvement to water quality and aesthetic treatments;
- Safety by reducing flooding impacts within the vicinity of the proposed project, and;
- Construction Impacts such as roadway closures that would significantly affect local residents.